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CHEMICAL CONTENT STUDY IN GANODERMA LUCIDUM COMMERCIAL PRODUCTS

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Abstract

In the past several decades there are growing appeals for utilizing plants as a source of chemicals that act as feed supplements and drugs for promoting health. This study was carried out to estimate: Firstly, The quality of phytochemicals on Ganoderma lucidum. The results exhibit that Saponins, Alkaloids, Tannins, Flavonoids, Phenols, and Glycosides were present in all samples of Ganoderma lucidum.
Secondly, the levels of trace elements (Mg, Fe, Zn, Mn, Cu, Cr, and V) in five samples of Ganoderma lucidum commercial products were estimated by flame atomic absorption spectrophotometry. Fe has the highest level with 130.60 ± 1.63 ppm, Followed by Mg at 50.76 ± 1.19 ppm and Mn at 20.19 ± 0.54 ppm, On the other hand, Cu, Cr, and V recorded the lower levels with 5.49 ± 0.35 ppm, 0.73 ± 0.04 ppm and 0.36 ± 0.02 ppm respectively.

Keywords: Carbohydrate, Ganoderma Lucidum, Iron, Saponins, Trace Elements.

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Introduction:

In the past several decades studies on the preprepared of alternative approaches to maintain and promote health have played an important role in the combination of traditional medicine into the mainstream health – care delivery

system [1,2].

Ganoderma lucidum is a medicinal mushroom recognized to have miraculous health benefits in Japan and China[3]. Ganoderma lucidum is used as a valuable source of feed supplements, medicine for reinforcement health and the immune system in humans, and as a coadjutant treatment in diseases such as hypertension, chronic hepatitis, and cancer, among others[4]. This mushroom is fruitful in sundry bioactive compounds at most terpenoids, proteins polysaccharides, steroids, and fatty acids[5].

There are plentiful studies performed to examine the presence of metals in Ganoderma lucidum, A common result showed that Ganoderma lucidum contains a high amount of minerals like zinc, manganese, iron, magnesium, potassium, and calcium. Essential metals like zinc, iron, copper, and manganese play a substantial function in the catalytic processes within the enzyme system that involves a wide domain of enzyme activities connected with metabolic and immune systems[6]. Moreover, living organisms demand traces of some heavy metals such as cobalt, iron, copper, manganese, zinc, and chromium, exaggerated levels of these metals can be deleterious to human health[7].

With all the above significant attributes of the Ganoderma mushroom, A new approach is therefore needed to analyze the mineral contents of some medicinal Ganoderma lucidum available on the market in order to estimate whether they contain the amount of the minerals in the right consumable amount.

The overall goal of this study is to analyze the levels of some minerals and trace elements (magnesium, iron, zinc, manganese, copper, chromium, and vanadium) in some samples of medicinal Ganoderma lucidum available on the market and datum will help to limit the consuming daily rate of medicinal Ganoderma lucidum.

Materials and Methods:

Five medicinal Ganoderma lucidum samples were manufactured by five different companies namely DXN pharmaceutical, Now, IPRO, Nature's way, and Nutriplus were domestic from the local market.

Preparation of the extracts

Weigh 100 g from the powder of each Ganoderma lucidum commercial products and separately soaked in 500 ml distilled water and ethanol 96% respectively at room temperature, then mixing it by incubator shaker for 48 hours, and then filtered by Whatman filter paper No.1. Dryness the extracted in oven at 37°C and refrigeration until used[8].

Nutritional and chemical composition

Moisture, protein, fat and ash were determined utilizing the Association of Official Analytical Chemists (AOAC, 1990) method[9]. While, the carbohydrate content was determined by the difference of the sum of all proximate composition from 100%[10].

Chemical detection of active compounds

- Determination of Saponins: Used the method in [11].
- Determination of Alkaloids: Used the method in [12].
- Determination of Tannins: Used the method in [13].
- Determination of Flavonoids: Used the method in [13].
- Determination of phenols: Used the method in [12].
- Determination of Glycosides: By using Fehling reagents.

Preparation of standard solution for Atomic Absorption Spectrophotometer (A.A.S) measurement

Tow gram powder of Ganoderma lucidum samples was dissolved in 10 ml of aquaregia and heated for 5 – 10 min and up to marked 25 ml by adding deionized water. Estimation of trace elements in samples was performed using atomic absorption spectroscopy (A.A.S) model AA-7000 (Shimadzu-Japan) [14].

The statistical analysis for this study was carried out by using the computer program (Microsoft Excel) and includes: Mean and Standard Deviation.

Results and Discussion:

The value for the chemical composition of Ganoderma lucidum is given in Table 1.

Table 1. Nutritional and chemical composition of Ganoderma lucidum.

Component	Mean ± S. D
Nutritional value g / 100 g	
Moisture	4.67 ± 0.06
Proteins	15.78 ± 0.14
Fats	1.57 ± 0.03
Ash	7.43 ± 0.06
Carbohydrates	70.55 ± 0.23

From the results, it clear that the carbohydrates were the most plentiful compounds, followed by proteins, ash, moisture and fats. This results ties well with previous study, where in the proximate composition of Ganoderma lucidum were very close to our results [15]. However, the value of carbohydrates in Ganoderma lucidum is lower than that reported by (Sharif et.al., 2016) and (Taofiq et.al., 2017) who found that the carbohydrates content of Ganoderma lucidum was to be 82.47±0.2 and 88.40±o.2 respectively [16,17]. While, fat and ash content in this study is agreement with (Ogbe and Obeka ,2013) who found that fat and ash content of Ganoderma lucidum were 1.52±0.09 and 8.42±0.13 respectively and is close to the value of fats and ash in our study [15]. Contrary to the finding of (Ogbe and Obeka ,2013) we find that the moisture content of Ganoderma lucidum to be 4.67±0.06 compared with 2.78±0.05 from (Ogbe and Obeka , 2013) .

Another promising finding was that chemical detection of active compound in Ganoderma lucidum and the results summarized in Table 2.

Table 2. Chemical detection of active compound in Ganoderma lucidum.

Test	Results
Saponins	+
Alkaloids	+
Tannins	+
Flavonoids	+
phenols	+
Glycosides	+

It shows the presence of phytochemicals such as Saponins, Alkaloids, Tannins, Flavonoids, Phenols, and Glycosides present in aqueous and alcoholic extracts. When comparing our results to those of older studies, it must be pointed out that the results of our study were in agreement with (Wood et.al., 2021) reported that Ganoderma lucidum contains all above-mentioned phytochemicals [18].

The results in Table 3. and Fig 1. refer to the concentration of the elements in Ganoderma lucidum.

Table 3. The levels of elements in samples of Ganoderma lucidum (mean ± S.D ppm, n=5)

Elements	mean ± S. D
Mg	50.76 ± 1.19
Fe	130.60 ± 1.63
Zn	8.45 ± 0.38
Mn	20.19 ± 0.54
Cu	5.49 ± 0.35
Cr	0.73 ± 0.04
v	0.36 ± 0.02

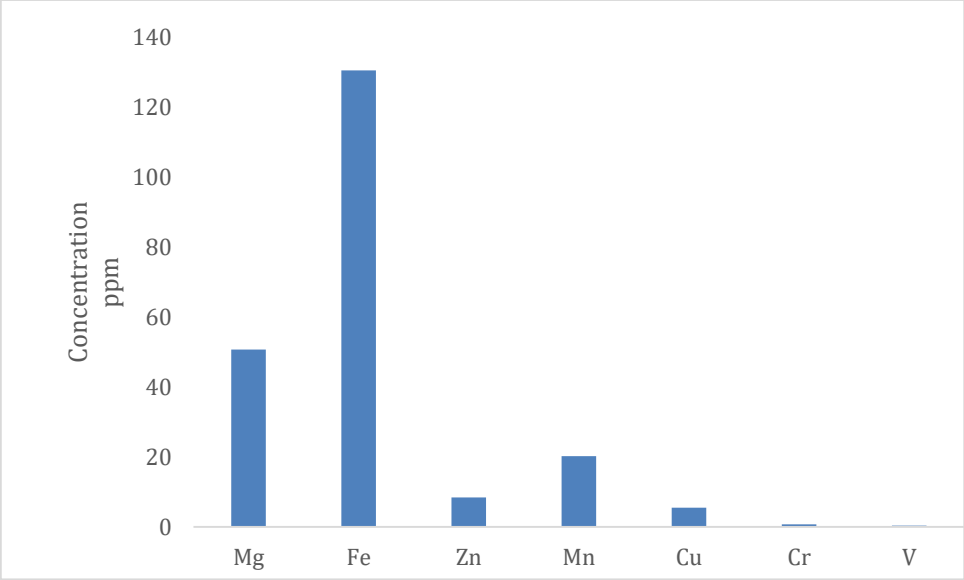

Figure 1. Concentration (ppm) of elements in samples of Ganoderma lucidum.

From the results, minerals analysis showed that the Ganoderma lucidum samples were rich in iron, magnesium, manganese, zinc, and copper. While the levels of chromium and vanadium were less as compared to other minerals.

Iron levels were detected at relatively higher contents with 130.60±1.63 µg/ml followed by magnesium 50.76±1.19 µg /ml and manganese 20.19 ±0.54µ g /ml. Overall a similar pattern of results was reported by (Tel-Cayan et.al., 2017) [19]. Contrary to the findings of our study (Sharif et.al.,2016) have demonstrated that magnesium has the highest levels as compared to other minerals followed by iron. When comparing our results refers to the levels of chromium and vanadium to those of older studies, it must be pointed out that our results ties well with the finding of (Quarcoo and Adotey, 2014). who found that the concentration of chromium and vanadium in Ganoderma lucidum were 0.60 µg/ml and 0.4 µ g/ml respectively and is close to the levels of chromium and vanadium in our study [20].

It is important to highlight the fact that the minerals are desired for cellular activity, skeletal growth, intestinal absorption, and chemical reaction in the body.

As discussed, this is due to the reality of minerals' benefits. For instance, iron considers an aback bone of red blood cells [21]. Magnesium plays an essential role in bone growth, moreover, the deficiency of magnesium levels in our body is also related to a risk factor for osteoporosis[22].

In the line with the idea of minerals importance, zinc is helpful for normal body development, protein synthesis, and recovery from illness. In fact, the roots of some mushrooms accumulate zinc around them [23].

The evidence suggested that manganese is a major constituent of many enzymes that work with vitamin K to back up blood clotting. In addition, at low levels, copper acts an essential role in enzyme action. Moreover, copper-centered enzymes of the body transfer iron [23].

It is of interest to know whether chromium is a heavy metal, it becomes a substantial mineral to the human when taken 50-200 µg daily. It has been related to lipid, carbohydrate, and protein metabolisms [24].

In the line with previous, vanadium is required nearly from all living cells at very low levels. Vanadium has been mentioned as anti-diabetic both in vitro and in-vivo[25].

Conclusion:

In conclusion, it would appear that medicinal Ganoderma lucidum contained appreciable amounts of proteins, carbohydrates, and minerals which are nutritional requirements to promote health. The finding of this study can be improved that all the samples of medicinal Ganoderma lucidum commercially products used in this study did not contain toxic elements and might be a good and safe source of trace minerals. Moreover, regular consumption of these products may act as a positive addition to a healthy diet.

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